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Addendum 2 to MUT/05/6

Cytogenetic changes in workers following pesticide exposure in world

Table arranged according to occupation

Subjects (exposed/controls)	End-point	Duration of exposure	Protective clothing	Results	Comments	Author
Production workers (23/23)	CA	4-17 years	Used all protective measures available	<b>Positive</b> Significantly increased total CA and number of cells with CA in workers compared to controls.	100 metaphases counted per subject	Antonucci and de Syllos Colus, 2000
Production workers (54/54)	Comet assay	8.57 years (range 3-13 years)	Not reported	<b>Positive</b> Significantly greater tail length in exposed workers compared to controls. Slight increase seen correlated with duration of exposure.	Samples collected between October and December. 50 cells scored per subject.	Grover, <i>et al.</i> , 2003
Pesticide sprayers (9/7/6)	CA	3 years	Not stated	<b>Positive</b> Significant increase in breaks and total CAs in exposed workers compared to controls at beginning, middle and end of spraying season. Significant increase in breaks and total CAs in dealer/controllers compared to controls.	Samples collected between April and October. 100 cells scored per subject. Groups of exposed workers, dealer/controllers and controls	Mohammad, <i>et al.</i> , 1995

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Pesticide applicators (26/26)	Not stated	8 hr/day in spring and winter	Not stated	<b>Positive</b> Total CA significantly increased in workers compared to controls.	Samples collected in January.	Rupa, <i>et al.</i> , 1991
Pesticide sprayers (23/18/20/33)	Not stated	Not stated	Not stated	<b>Positive</b> Significantly increased chromosome rearrangements in fumigant applicators and insecticide applicators but not herbicide applicators compared to controls. No significant difference in the number of breaks occurring at fragile sites between all groups and controls.	Workers groups; used fumigants; insecticides; herbicides; controls. Blood samples were collected from intoxicated subjects two weeks after healthy subjects. 100 cells scored per subject.	Garry, <i>et al.</i> , 1996
Pesticide sprayers (12/9).	MN	> 12 weeks	Not stated	<b>Negative</b> No significant difference in MN frequency in workers before and after 2,4-D exposure or compared to controls.	Levels of 2,4-D measured in urine. Blood samples collected before and after exposure. Lymphocytes cultures for 72 hours.	Holland, <i>et al.</i> , 2002
Pesticide sprayers (38/16)	MN	September – November	Not stated	<b>Negative</b> No significant difference in MN frequency in workers before and after malathion exposure compared to controls.	Levels of malathion measured in urine. Samples collected September and December. Lymphocytes cultured for 72 hours.	Titenko-Holland, <i>et al.</i> , 1997
Floriculturist (41/41)	CA	39.49 ± 20.25 (range 6-66 months)	Not stated	<b>Positive</b> Significant increase in CAs in exposed group compared to controls. No correlation between CA and duration of exposure.	100 cells scored per subject.	Paz-y-Mino, <i>et al.</i> , 2002

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Floriculturist (36/15)	CA	> 10 years	Little or no protection used	<b>Positive</b> Significantly higher number of exchange-type aberrations in exposed workers compared to controls. No difference in CA between workers with or without chronic intoxication.	Samples collected during spring/summer.	Dulout, <i>et al.</i> , 1985
Agricultural worker (20/20)	CA Tandem probe FISH assay	Continuous pesticide use	None used	<b>Negative</b> No significant differences in CA between exposed workers and controls	Samples transported by air. 150 cells scored per subject.	Au, <i>et al.</i> , 1999
Agricultural worker (18/21)	MN	>16 weeks	Not stated	<b>Negative</b> No significant differences in MN frequency between workers and controls. No significant differences in MN according to duration of exposure.	Samples collected in October-November at end of season. Isolated lymphocytes cultured for 72 hours.	Davies, <i>et al.</i> , 1998
Agricultural worker (30/	CA	> 5 years	Not stated	<b>Negative</b> No significant differences in chromatid breaks or total chromatid breaks between workers and controls.	100 cells counted	Hoyos, <i>et al.</i> , 1996
Forester (25/15)	CA	> 5 days/year	Not stated	<b>Positive</b> Significantly higher chromosome deletions, gaps and breaks in workers spraying > 1000 gallons of herbicides compared to those spraying smaller volumes or controls. No correlation between urinary 2,4-D concentrations and CAs.	Pesticides applied by back pack, boom spray, aerial or skidder. Samples collected within 24 hours of end of peak 2,4-D application season. 2,4-D measured in urine.	Garry, <i>et al.</i> , 2001

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